September 29, 2009

Invitation for Participation in
Electronic Toll Collection (FasTrak®) Switchable Toll Tag Prototype Functionality Test

Dear Supplier:

The Bay Area Toll Authority (BATA) invites your firm to participate in a prototype functionality test of occupancy self declaration switchable Electronic Toll Collection Tags (heretofore referred to as "switchable toll tags").

The switchable toll tag shall provide the functionality to allow the customer to self-declare vehicle occupancy status as single occupant vehicle (SOV), two occupant vehicle (HOV-2) or three or more occupant vehicle (HOV-3+). These tags shall have an easily accessible switching mechanism (e.g., slide, dial, push button, etc.) on the transponder. The switchable toll tags tag shall be able to transmit a standard Title 21 signal with encoding to represent occupancy. Customers will set the transponder occupancy and the toll system will calculate tolls appropriately for each trip. The switchable toll tag will aid in enforcement of toll lanes and allow for future tiered pricing based on vehicle occupancy.

BATA will provide $100 per toll tag via a Purchase Order (PO) to each of the qualified firms that produces tags pursuant to this Invitation for Participation (IFP). Each qualified firm may manufacture and deliver sets of 10 approved switchable toll tags with any one type of switching mechanism, to be delivered by December 17, 2009. A firm may submit up to five sets of toll tags if each set has a different type of switching mechanism (e.g., slide, dial, push button, etc.).

The prototype functionality test is a pre-cursor to a potential future procurement, which may include a full beta test, of switchable toll tags for permanent use and distribution for BATA's FasTrak® toll programs. **BATA reserves the right to limit the participation in any future procurement of switchable toll tags to the firms that participate in this IFP.** However, this IFP does not obligate BATA in any fashion to a future procurement of switchable toll tags. In addition, BATA reserves the right to order additional switchable toll tags (i.e., more than five sets or 10 tags per switching mechanism) from any one supplier for purposes of the prototype functionality test.

This letter, together with its enclosures, comprises the IFP for this Project. Notices of Intent to Participate should be submitted in accordance with the instructions stated herein.

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Notice of Intent to Participate Due Date

Interested firms must submit a Notice of Intent to Participate by 4:00 p.m., Wednesday, October 14, 2009. Notices received after that date and time will not be considered.

BATA Point of Contact

All inquiries relating to this IFP should be submitted to the Project Manager, Stephen Wolf, at the address shown below. For telephone inquiries, call (510) 817-5968. Email inquiries may be directed to swolf@mtc.ca.gov.

Stephen Wolf
Bay Area Toll Authority
Joseph P. Bort MetroCenter
101 Eighth Street
Oakland, California 94607-4700

Background

Currently, BATA operates the toll collection system on the seven state-owned toll bridges in the San Francisco Bay Area. The bridges include the Antioch, Benicia-Martinez, Carquinez, Richmond-San Rafael, Dumbarton, San Mateo-Hayward and San Francisco-Oakland Bay Bridges. Additionally, through its contractor, BATA operates a customer services center (CSC) that services the customer accounts for the seven state-owned bridges and the Golden Gate Bridge, owned by the Golden Gate Bridge, Highway and Transportation District (GGBHTD). The CSC is located in San Francisco. Both Caltrans and GGBHTD collect tolls from bridge users either manually at staffed lanes or automatically through an electronic toll collection (ETC) system. Both agencies operate their ETC systems in compliance with the California Code of Regulations (Title 21) specifications under the FasTrak® brand. FasTrak® toll tags can be purchased from BATA's CSC contractor through the FasTrak® website or from select retail stores throughout the Bay Area.

BATA, in conjunction with other transportation agencies in the Bay Area, is planning the development of a network of tolled Express Lanes. The Express Lane network will use the FasTrak® electronic toll collection system for the collection of tolls. As part of the development of the network, the deployment of a switchable toll tag, allowing customers to self-declare vehicle occupancy, is considered the most effective means for the Express Lanes occupancy enforcement. Additionally, other toll agencies in the state are considering the deployment of switchable tags for their operations.

As stated above, the concept of the switchable tag is to provide the functionality to allow customers to self-declare vehicle occupancy. The tags will be set by the customer for SOV, HOV-2, or HOV-3+ status. These tags shall have an easily accessible switching mechanism (e.g. slide, dial, push button, etc.) on the transponder that minimizes the possibility of a customer error in setting occupancy status. Customers will set the transponder occupancy and the system will calculate tolls appropriately for each trip. The tag will be able to transmit a Title 21 compliant signal based on the tag setting.

Upon receipt of the functional prototype test tags submitted in response to this IFP, BATA shall test them. The major functional requirements that will be tested include:

- The switchable transponders shall be Title 21 compliant and interoperable with all existing toll facilities in California, without any modification required by other California toll agency tolling systems for any of the switch settings.

- These toll tags shall have a switching mechanism on the transponder, thereby allowing customers to declare their occupancy status for a particular trip.

- The switch mechanism on the tag shall be robust and simple for users to set correctly.

- The switch shall clearly show the occupancy number that has been set. The visual display, which need not be electronic, should be maintained after the transponder has been set. For ease of use, a slide, dial, or push button switch is preferred.

- The design shall minimize the impact on the battery life.

- The design may consider safeguards to prevent changing the setting while driving through a series of toll zones along a journey.

Minimum Qualifications

To be eligible to participate in this prototype functionality test, firms must have successfully furnished at least one (1) commercial contract for no fewer than 100,000 ETC vehicle toll tags that are currently in use. BATA will require verification of these qualifications prior to issuance of a Purchase Order.

Specifications and Schedule

The specifications for this project are described in *Appendix A, Specifications for ETC FasTrak® Switchable Toll Tags.* All requested fully functional prototype tags shall be delivered to BATA on or before 4:00 p.m. Thursday, December 17, 2009. **If the toll tags are not received by that date and time, supplier may be considered ineligible should this IFP be used to prequalify suppliers for a future procurement of switchable toll tags.**

BATA intends to test the tags on or before February 28; payment shall be made to supplier following completion of testing.

Notice of Addenda and Requests for Clarification

All potential participants are responsible for checking the BATA website, <www.mtc.ca.gov>, for any changes to this invitation. Requests for clarification of IFP provisions must be received no later than October 7, 2009 to guarantee consideration. BATA will provide responses at its sole discretion.

Submission of Notice of Intent to Participate

Interested participants shall submit a Notice of Intent to Participate no later than 4:00 p.m. Wednesday, October 14, 2009. The Notice shall:

1. Include a cover letter indicating supplier's intent to participate, signed by an official authorized to enter into an agreement.
2. Indicate how supplier meets minimum qualifications.
3. Indicate the number of sets of switchable toll tags to be submitted. (A firm may submit up to five sets of switchable toll tags, each set containing a unique switching mechanism.)
4. Include a description of the switching mechanism for each set.
5. Provide a life-size schematic drawing of each type of toll tag.

Supplier Selection

While BATA is expected to issue a PO to each of the qualified firms, BATA reserves the right to reject tag concepts or ask for revisions for any reason. BATA will notify participants by October 23, 2009, if their tag concept(s) have been approved; BATA will then provide serial numbers to each supplier to affix to its tags and issue a PO. POs shall be issued for a maximum of 5 sets of 10 switchable toll tags per supplier for a maximum dollar value of $5,000 or $100 per tag, except as otherwise stipulated in this IFP.

Selection Timetable

Wednesday, October 7, 2009, 4:00 p.m.	Closing date and time for receipt of requests for clarification of IFP.
Wednesday, October 14, 2009, 4:00 p.m.	Closing date and time for receipt of intent to propose documentation.
Friday, October 23, 2009	BATA to notify participants if their toll tag concept has been approved.
Thursday, November 5, 2009 (approximate)	BATA to issue purchase order and provide serial numbers to firms that submitted their intent to propose.
Thursday, December 19, 2009, 4:00 p.m.	Closing date & time for receipt of the functional prototype tags.

General Conditions

This IFP and any material submitted in response to this IFP are subject to public inspection under the California Public Records Act (Government Code § 6250 *et seq*.), unless exempt by law. Other than proprietary information or other information exempt from disclosure by law, the content of Notice of Intent to Participate ("NIP") submitted to BATA will be made available for inspection consistent with its policy regarding Public Records Act requests.

content of Notice of Intent to Participate ("NIP") submitted to BATA will be made available for inspection consistent with its policy regarding Public Records Act requests.

Each supplier must clearly mark each page of the NIP that the supplier considers to contain trade secrets or other commercial or financial information that the supplier believes would cause substantial injury to the supplier's competitive position, if disclosed, and include the following notice at the front of its NIP:

> "The data on the following pages of this NIP, marked along the right margin with a vertical line, contain technical or financial information which are trade secrets and/or which, if disclosed, would cause substantial injury to the supplier's competitive position. The supplier requests that such data be used for review by BATA only, but understands that exemption from disclosure will be limited by BATA's obligations under the California Public Records Act. If a purchase order is awarded to the supplier submitting this NIP, BATA shall have the right to use or disclose the data, unless otherwise provided by law. [List pages]."

Failure to include this notice with relevant page numbers shall render any individual markings inadequate. Individual pages shall accordingly not be treated confidentially. **Any language purporting to render the entire NIP confidential or proprietary will be regarded as ineffective and will be disregarded.**

In the event properly marked data is requested pursuant to the California Public Records Act, the supplier will be advised of the request and given the opportunity to provide to BATA a detailed statement indicating the reasons it believes the information should be withheld from disclosure. The supplier may be asked by BATA, as a condition of non-disclosure, to indemnify and hold BATA harmless, in the event of claims made as a result of non-disclosure.

BATA reserves the right not to issue a PO to any supplier. A signed BATA Purchase Order (refer to *Appendix B* for General Conditions) mailed or delivered to participants shall constitute binding contracts.

Thank you for your participation.

Sincerely,

Andrew B. Fremier
Deputy Executive Director, Operations

APPENDIX A

SPECIFICATIONS FOR SWITCHABLE ETC FASTRAK® TOLL TAGS

1. General

All toll tags will be new self declaration (SOV, HOV-2, or HOV-3+ occupancy), internally-mounted non-retail toll tags. The toll tags shall be pre-programmed and shall conform to the specifications described below. These specifications define the requirements for non-retail toll tags. Under contract, the Supplier shall manufacture and deliver California Code of Regulations (CCR), Title 21-compliant toll tags in accordance with these specifications.

2. Environmental Specifications

The FasTrak® toll tags shall comply with the environmental specifications provided below:

Characteristic	Specification
Operating Temperature:	-25 to +85 degrees Celsius
Storage Temperature:	-40 degrees Celsius to 100 degrees Celsius
Humidity:	95% RH, 60 degrees Celsius to 30 degrees Celsius on 24 hour cycle, 10 cycles
Vibration:	10g peak 10Hz to 500Hz, 60 minute/axis, 3 axis, Logarithmic
Mechanical Shock:	30g, 10ms, half sine wave 2 shocks/axis, each direction for 3 axis, total of 12 shocks
Thermal Shock:	-25 degrees Celsius to 85 degrees Celsius, 10 cycles, 30 minute dwell

3. Toll Tag Requirements

Compliance:
Toll tags shall be compatible with all California toll facilities without any modification to the existing equipment configurations. Toll tags shall comply with the environmental specifications identified above, and the CCR, Title 21, Chapter 16, "Compatibility Specifications for Automatic Vehicle Identification Equipment", Articles 1-4 (see *Appendix A-1*).

Serial Numbers:
Each toll tag shall be pre-programmed, prior to delivery, with a unique number, designated by BATA (based on facility code and ID). Each pre-programmed toll tag number shall be permanently and legibly affixed to the exterior surface of the toll tag in a bar code format. BATA will provide the Supplier with the appropriate serial number ranges.

Audio Indicator:

Each toll tag shall provide an audio indicator for communicating the transaction status to the user. The system shall be configurable to allow 0 to 4 beeps.

Switch:
Each toll tag shall have a robust, simple to use switching mechanism for the user to set to the number of occupants (1, 2, or 3+).

Occupancy Encoding:

Setting	Tag Type				Facility Code																	Internal Tag ID									
SOV	0	0	0	0	0	1	1	0	0	1	0	1	0	1	0	1	0	1	1	1	1	1	0	0	0	1	1	0	1	1	0	1
HOV-2	0	1	0	0	0	1	1	0	0	1	0	1	0	1	0	1	0	1	1	1	1	1	0	0	0	1	1	0	1	1	0	1
HOV-3+	0	1	0	1	0	1	1	0	0	1	0	1	0	1	0	1	0	1	1	1	1	1	0	0	0	1	1	0	1	1	0	1

The above encoding is an example of the encoding that will be used for the different occupancy settings. The final encoding will be mailed from BATA to each qualified supplier on approximately November 5, 2009.

Visual Indicator:
Each toll tag shall clearly display the current occupancy setting.

Dimensions:
Internally-mounted toll tags shall not exceed 10 x 8.5 x 1.5 cm (3.9 x 3.3 x 0.6 in).

Velcro Mounting Strips:
Two Velcro strips approximately 1.6 by 7.6 cm (5/8 by 3 in), shall be affixed to the front of each toll tag for mounting purposes.

4. Testing

BATA shall test tags to assess the following functional requirements:

- The switchable transponders shall be Title 21 compliant and interoperable with all existing toll facilities in California, without any modification required by other California toll agency tolling systems for any of the switch settings.

- These toll tags shall have a switching mechanism on the transponder, thereby allowing customers to declare their occupancy status for a particular trip.

- The switch mechanism on the tag shall be robust and simple for users to set correctly.

- The switch shall clearly show the occupancy number that has been set. The visual display, which need not be electronic, should be maintained after the transponder has been set. For ease of use, a slide, dial, or push button switch is preferred.

- The design shall minimize the impact on the battery life.

- The design may consider safeguards to prevent changing the setting while driving through a series of toll zones along a journey.

APPENDIX A-1

CALIFORNIA CODE OF REGULATIONS, TITLE 21, CHAPTER 16

Article 5. Project Funding

§ 1676. Project Funding.

Funds made available for projects under subsections (b) and (c) of Section 1670 may be used for public transportation projects which are included in a State program of projects for public transportation in areas other than urbanized areas. The Federal share for any construction or capital project under this Section shall not exceed eighty percent(80%) of the net cost of such construction or capital project. The Federal share for any project for the payment of financial assistance for operating expenses as defined by the United States Department of Transportation shall not exceed fifty percent (50%) of the net cost of such operating expense project. At least fifty percent (50%) of the remainder of the net cost for both capital and operating projects shall be provided in cash, or cash equivalent from sources other than Federal funds or revenues from the operation of public mass transportation systems. Up to fifty percent (50%) of the remainder of the net cost may be made up of unrestricted funds from other Federal programs.

NOTE: Authority cited: Section 14031, Government Code; and Section 18 of the Urban Mass Transportation Act of 1964 (49 USC 1614). Reference: Section 14031, Government Code; Section 18 of the Urban Mass Transportation Act of 1964 (49 USC 1614); and Urban Mass Transportation Administration Circular 9040.1.

HISTORY

Amendment filed 1–17–85; effective thirtieth day thereafter (Register 85, No. 3).

§ 1677. Use of Other Federal Funds.

Applicants that have used funds pursuant to Section 5 or Section 9 of the Urban Mass Transportation Act in the past for services that extend into nonurbanized areas shall continue to use these Section 5 or Section 9 funds for these purposes as long as the services are appropriate for the area. Section 18 funds shall be used only for new or expanded services in these nonurbanized areas.

NOTE: Authority cited: Section 14031, Government Code; and Section 18 of the Urban Mass Transportation Act of 1964 (49 USC 1614). Reference: Section 14031, Government Code; Section 18 of the Urban Mass Transportation Act of 1964 (49 USC 1614); and Urban Mass Transportation Administration Circular 9040.1

HISTORY

Amendment filed 1–17–85; effective thirtieth day thereafter (Register 85, No. 3).

Article 6. Planning

NOTE: Authority cited: Sections 14031 and 14033, Government Code. Reference: Sections 14031 and 14033, Government Code.

HISTORY

1. Repealer of Article 6 (Sections 1678 and 1679) filed 1–17–85; effective thirtieth day thereafter (Register 85, No. 3).

Article 7. Programming

NOTE: Authority cited: Sections 14031 and 14033, Government Code. Reference: Sections 14031 and 14033, Government Code.

HISTORY

1. Repealer of Article 7 (Sections 1680 and 1681) filed 1–17–85; effective thirtieth day thereafter (Register 85, No. 3).

Article 8. Implementation

NOTE: Authority cited: Sections 14031 and 14033, Government Code. Reference Sections 14031 and 14033, Government Code.

HISTORY

1. Repealer of Article 8 (Sections 1685 and 1686) filed 1–17–85; effective thirtieth day thereafter (Register 85, No. 3).

Article 9. Accounting, Reporting, and Auditing

NOTE: Authority cited: Sections 14031 and 14033, Government Code. Reference: Sections 14031 and 14033, Government Code.

HISTORY

1. Repealer of Article 9 (Sections 1688 and 1689) filed 1–17–85; effective thirtieth day thereafter (Register 85, No. 3).

Article 10. Settlement of Conflicts

NOTE: Authority cited: Sections 14031 and 14033, Government Code. Reference: Sections 14031 and 14033, Government Code.

HISTORY

1. Repealer of Article 10 (Section 1690) filed 1–17–85; effective thirtieth day thereafter (Register 85, No. 3).

Chapter 16. Compatibility Specifications for Automatic Vehicle Identification Equipment

Article 1. Summary of Key Compatibility Specifications for Automatic Vehicle Identification Equipment

§ 1700. Summary.

The compatibility specifications for automatic vehicle identification (AVI) equipment have been developed around two principal components: a reader and a transponder. The minimum role of the reader is to:

1) trigger or activate a transponder.

2) poll the transponder for specific information, and

3) provide an acknowledge message to the transponder after a valid response to the polling message has been received.

A half–duplex communications system is envisioned where the transponder takes its cues from the reader.

The specification is meant to define a standard two way communications protocol and to further define an initial set of data records.

A summary of the key compatibility specifications found in this Chapter are set forth below:

Reader Specifications:	
Reader Trigger Signal	33 microseconds of unmodulated RF
Reader Send Mode (Downlink)	
Carrier Frequency:	915 ± 13 MHz (subject to FCC assignment)
Carrier Modulation:	Unipolar ASK (Manchester Encoded)
Data Bit Rate:	300 kbps
No. Data Bits:	Application Specific
Field Strength at Transponder Antenna:	500 mV/m (minimum)
Transponder Specifications:	
Technology Type:	Modulated Backscatter
Transponder Antenna Polarization:	Horizontal
Field–of–View:	Operation within 90° conical angle
Location:	Front of Vehicle
Transponder Send Mode (Uplink)	
Carrier Frequency:	Same as Reader Send Mode
Carrier Modulation:	Subcarrier AM
Subcarrier Modulation:	FSK
Subcarrier Frequencies:	600 kHz ± 10% and 1200 kHz ± 10%
Data Bit Rate:	300 kbps
No. Data Bits:	Application Specific
Receiver Field–Strength Threshold:	500 mV/m ± 50 mV/m (minimum)

NOTE: All mV/m specifications are in RMS voltage.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New chapter 16, articles 1–4 and sections 1700–1705.8, not consecutive filed 6–26–92; operative 7–27–92 (Register 92, No. 26).

2. Amendment filed 5–1–98; operative 5–31–98 (Register 98, No. 18).

§ 1701. Definition of Technical Terms.

The following are definitions of technical terms used throughout this Chapter:

(a) AM – Amplitude modulation
(b) ASK – Amplitude shift keying
(c) BCC – Block check character
(d) CRC – Cyclic redundancy check
(e) CW – Continuous wave
(f) EIRP – effective isotropically radiated power = gain x net power
(g) EM – Electromagnetic
(h) FCC – Federal Communications Commission
(i) FSK – Frequency–shift keying
(j) ID – Device identification
(k) kbps – kilobits per second
(l) kHz – kilohertz (10^3 hertz)
(m) kph – kilometer per hour
(n) MHz – megahertz
(o) m/Vm – milliVolts/meter
(p) Reader – A fixed–position reader, associated transmit and receive (Tx/Rx) antenna(s), and modulation and demodulation hardware and software.
(q) RF – Radio frequency
(r) Transponders – Electronic devices that contain information which can be communicated to the reader. The transponders may have the capability to read and write information.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).
2. Amendment of subsections (c)–(e), new subsection (o), subsection relettering, and amendment of newly designated subsection (r) filed 5–1–98; operative 5–31–98 (Register 98, No. 18).

Article 2.0. Introduction

§ 1702.1. Objectives.

This chapter defines the compatibility requirements for automatic vehicle identification (AVI) equipment. Supplemental agency (e.g., toll authority) specifications will detail the technical, environmental, and operational specifics for each site implementation. The immediate mandate for this compatibility specification is for electronic toll collection.

AVI equipment will essentially consist of two functional elements: vehicle–mounted transponders and fixed–position reader units.

The specification is meant to define a standard communications protocol and to further define an initial set of data records. The initial data records are designed for voluntary implementations of electronic toll collection.

It is further envisioned that more complex data records will be developed to handle anonymous transactions, secure funds transfers, information transfers, and other transactions between the reader and the transponder that will be defined as needed. The transponders may have the capability to read and write information. Caltrans shall function as the standards monitoring authority to authorize the use of new record types and to assign record type numbers to newly authorized records. Caltrans shall pass this responsibility to an appropriate standards setting organization when one is established and recognized with Caltrans retaining representation in the standards setting organization.

Nothing in these regulations shall preclude the addition of functions and technologies to the transponder and/or reader systems.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).
2. Amendment adding last sentence filed 2–16–93; operative 3–18–93 (Register 93, No. 8).
3. Amendment of first and fourth paragraphs filed 5–1–98; operative 5–31–98 (Register 98, No. 18).

§ 1702.2. Organization.

This chapter consists of four articles. An overview and summary of the key specifications is given in Article 1. Article 2 presents the objectives and definitions for data codes. Articles 3 and 4 provide specifications unique to the reader and transponder respectively.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).

§ 1703. Definitions for Data Codes.

(a) Agency Code: This 16–bit code field identifies the agency that has authority to conduct the transaction.

(b) Byte Order: Numeric fields shall be transmitted most significant bit first. If a numeric field is represented as multiple bytes, the most significant bit of the most significant byte is transmitted first. This document represents the most significant and first transmitted to the left on a line and to the top of a multi line tabulation.

(c) Error Detection Code: The error detection code utilized in the defined records is the CRC–CCITT, with a generator polynomial of $X^{16}+X^{12}+X^5+1$. This results in a 16–bit BCC transmitted with each data message. The data field protected by the CRC excludes any preceding header in every case.

(d) Filler Bits: Filler bits are used to adjust the data message length to a desired length and shall be set to zero.

(e) Header Code: The header is the first field in each data message for either reader or transponder transmissions and consists of an 8–bit and a 4–bit word for a total of 12 bits. The header provides a signal that may be used by a receiver to self–synchronize (selsyn) with the data being transmitted, thus the notation selsyn. The selsyn signal has binary and hexadecimal values: 10101010 and AA, respectively.

The header code also provides for a unique, 4 bit flag that is recognized by a receiver decoder as the end of the header with the data message to follow. The flag signal has binary and hexadecimal values: 1100 and C respectively.

(f) Reader ID Number: This 32–bit field is used to uniquely identify the reader conducting the transaction.

(g) Transaction Record Type Code: This 16–bit code uniquely identified a specific type of valid transaction between a reader and a transponder. This code uniquely defines the transponder message fields and functions permissible with the transaction type specified by the polling message as described in Section 1704.5(e)(1). Hexadecimal numbers 1 through 7FFF are set aside for transponder message structures and 8000 through FFFF are dedicated for reader–to–transponder message structures.

(h) Transaction Status Code: Used to provide status information to the transponder.

(i) Transponder ID Number: This 32–bit code uniquely identifies which transponder is responding to a polling request or is being acknowledged.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).
2. Amendment of subsections (a), (c), (e) and (g) filed 5–1–98; operative 5–31–98 (Register 98, No. 18).

Article 3. Reader Specifications

§ 1704.1. General.

The reader will transmit a RF trigger pulse to activate (turn–on) the transponders. After a time delay, the reader then will transmit an encoded signal, referred to as the polling message which, upon detection and decoding by the transponder, will provide initial information to the transponder including the type of transaction the reader wishes to conduct.

The reader will then transmit an unmodulated CW.RF signal for the transponder to modulate with a data message while backscattering to the reader. The reader may repeat the polling–to–backscattering sequence

until it obtains an error free data message from the transponder. The reader will then transmit an encoded acknowledge message to the transponder providing status information and requesting that the transponder not respond to the same polling message again for a fixed time period.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).
2. Amendment filed 5–1–98; operative 5–31–98 (Register 98, No. 18).

§ 1704.2. RF Carrier Frequency.

The RF carrier frequency shall be taken from the 915 MHz ± 13 MHz range. Specific frequency and bandwidth depend upon pending FCC assignment.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).

§ 1704.3. Reader Antenna Specifications.

(a) Reader Antenna Polarizations.

The reader transmit and receive antennas shall have predominant EM field components that are co–polarized to the horizontal polarization specified for the transponder transmit and receive antennas in section 1705.3(a). Horizontal, linear, circular or elliptical polarizations are allowed.

(b) Reader Antenna Location.

The reader antenna location is site specific.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).
2. Amendment of subsection (a) filed 5–1–98; operative 5–31–98 (Register 98, No. 18).

§ 1704.4. Reader–to–Transponder Trigger Pulse.

(a) Trigger Pulse Definition.

The reader shall provide a wakeup trigger for the transponder. The trigger shall consist of a 33 microsecond long, RF pulse at the assigned carrier frequency that is modulated with a continuous string of ones. The trigger pulse shall be followed immediately by a delay (i.e., no RF transmission) of 100 microseconds duration. The wakeup pulse is intended to signal a dormant transponder to fully activate itself.

(b) Trigger Pulse Field Strength.

The required horizontal component of field strength produced by the trigger pulse at the maximum downlink range (site dependent) of the reader shall be greater than 500 mV/m.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).

§ 1704.5. Reader Communications Protocol.

(a) AM Modulation Scheme.

The downlink (reader–to–transponder) modulation scheme shall be unipolar ASK of the RF carrier using Manchester encoding. A data bit '1' is transmitted by sending an RF pulse during the first half of the bit period and no signal during the second half, while for a '0' data bit the reverse order is used; i.e., no signal during the first half of the bit period and an RF pulse transmission during the second half.

(b) Data Bit Rates.

The data bit rate for reader–to–transponder messages shall be 300 kbps.

(c) Field Strength.

The field strength of a reader data message at the transponder shall be greater than 500 mV/m.

(d) Standard Reader Data Message Format.

The standard portion of a reader data message shall consist of a header and transaction record type code. The subsequent length, data content, and error detection scheme shall then be established by the definition for that transaction record type.

(e) Reader Data Message Formats for AVI.

There may be several reader–to–transponder data message formats. The format is determined by the transaction record type code sent by the reader. The following is the reader–to–transponder message format presently specified for AVI electronic toll collection applications:

(1) Reader Transaction Record Type 1 (Polling Message).

The polling message (which follows the 100 microsecond delay after the trigger signal) tells the transponder the type of transaction the reader wishes to conduct. For AVI electronic toll collection applications, reader transaction record type 1 (polling message) also would identify the agency or toll authority. For AVI applications, the reader–to–transponder yype 1 polling message shall be structured using the following ordered data bit fields:

Field Definition	*No. Bits*	*Hexadecimal Value*
Header Code		
Selsyn	8	AA
Flag	4	C
Transaction Record Type Code	16	8000
Agency Code	16	
Error Detection Code	16	
	Total: 60	

(2) Reader Transaction Record Type 2 (Acknowledge Message).

A reader–to–transponder acknowledge data message shall be provided to inform specific transponders that they have been successfully processed and to stop responding to further identical reader polling requests. The acknowledge message is used to terminate the transaction, and is only sent if the transaction is successfully completed. Reader transaction record type 2 (acknowledge message) shall consist of the following ordered data bit fields:

Field Definition	*No. Bits*	*Hexadecimal Value*
Header		
Selsyn	8	AA
Flag	4	C
Transaction Record Type Code	16	C000
Transponder ID Number	32	
Reader ID Number	32	
Transaction Status Code	16	
Error Detection Code	16	
	Total: 124	

(f) Reader End–of–Message Frame.

The end–of–message signal for reader–to–transponder data messages shall consist of a minimum of 10 microseconds of no RF carrier signal. Transponder decoders shall have the ability to detect this condition as an invalid Manchester code.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).
2. Amendment of subsections (d)–(f) filed 5–1–98; operative 5–31–98 (Register 98, No. 18).

§ 1704.6. Reader Field Strength for Modulated Backscattering.

The electric field strength produced by a reader is a function of the EIRP. The EIRP required to detect a modulated backscattered RF signal from a transponder with a reasonably high signal–to–noise ratio is determined by the maximum range to the transponder and the detection sensitivity of the reader receiver plus any gain margin. If the overall gain characteristics of the transponder were held constant, the required EIRP then becomes site dependent.

The electric field strength to accomplish modulated backscattering is expected to be lower than that required for triggering a transponder or for sending a reader data message. Sensitive reader receivers likely will be necessary, however, such as that obtained with homodyne or heterodyne technology.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).

Article 4. Transponder Specifications

§ 1705.1. General Description.

Transponders will be encoded with unique identification data together with other coded data as described in this section. On passing through any AVI reader zone, the transponder will provide the coded data to the reader only on receipt of a valid reader polling command. Transponders must be capable of being turned on and off as specified herein. transponders must be capable of two–way data communications. Transponders may be portable. The transponders may have the capability to read and write information.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).
2. Amendment filed 5–1–98; operative 5–31–98 (Register 98, No. 18).

§ 1705.2. Transponder RF Carrier Frequency.

The transponder RF carrier frequency in a backscatter system is identical to that used by the reader; the frequency will be in the range of 915 MHz ± 13 MHz. The transponder shall be capable of operating over the full ± 13 MHz band to allow site flexibility in reader implementation.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).

§ 1705.3. Transponder Transmit and Receive Antennas.

(a) Antenna Polarizations.

The transponder transmit and receive antennas shall have EM field components that are predominantly horizontally polarized transverse to normal traffic flow. Horizontal, linear, circular or elliptical polarizations are allowed.

(b) Antenna Field of Views.

The transponder transmit and receive antennas shall have a field of view which is a 90° cone in front of the vehicle. The projection of the horizontal component of the cone's axis shall be parallel to the lane and the vertical component of the cone's axis shall be 35° horizontal.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).
2. Amendment of subsection (a) filed 5–1–98; operative 5–31–98 (Register 98, No. 18).

§ 1705.4. Transponder Activation.

(a) Activation Timing.

Within 1 millisecond of entry into the reader's modulated RF field, a transponder shall be fully activated and ready to decode the polling message from the reader within 100 microseconds of receipt of a 33 microsecond long modulated RF trigger pulse from the reader.

(b) Activation Timing for Battery Power Management.

As an alternative to 1705.4(a), a delay of 20 additional milliseconds is permissible for a transponder using multiple–stage activation to conserve battery life. Within 21 milliseconds of entry into the reader's modulated RF field, such a transponder shall be fully activated and ready to decode the polling message from the reader within 100 microseconds of receipt of a 33 microsecond long modulated trigger pulse from the reader.

(c) Activation Field Strength.

The transponder receiver shall be capable of recognizing and acting on a trigger signal and polling message when the free–space field strength at the transponder location exceeds 550 mV/m and will not respond to field strengths below 450 mV/m (Electric field strengths are to be measured in free–spece and in the absence of any vehicle). After completion of the polling message, the transponder shall begin modulating and backscattering RF with continuous zero bits. 100 microseconds after completion of the polling message, the transponder shall begin transmitting its message. If a newly activated transponder does not immediately receive a polling message. it shall remain activated and ready to receive a subsequent reader message for at least 20 milliseconds.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).
2. Repealer and new section filed 5–1–98; operative 5–31–98 (Register 98, No. 18).

§ 1705.5. Transponder Communications Protocol.

(a) Subcarrier Modulation Scheme.

The transponder–to–reader (uplink) modulation scheme shall be amplitude modulation of an RF carrier backscatter created by varying the reflecting crossection of the antenna as seen by the incident carrier signal. The antenna crossection shall be varied between upper and lower limits with a 50 percent duty cycle and rise and fall times of less than 75 nanoseconds. The transponder baseband message signal shall modulate the subcarrier using FSK modulation with a center frequency of 900 kHz and frequency deviation of ± 300 kHz. The lower and upper subcarrier frequencies correspond to data bits '0' and '1' respectively. The message information is conveyed by the subcarrier modulation frequencies of the transponder backscattered signal and not by amplitude or phase.

(b) Data Bit Rates.

The data bit rate for transponder–to–reader data messages shall be 300 kbps.

(c) Field Strength.

The field strength at which a transponder data message is transmitted using backscatter technology is dependent upon the incident field strength from the reader, the transponder receive and transmit antenna gains, and any RF gain internal to the transponder. The transponder and antenna gain taken together shall effect a change in the backscattering cross section of between 45 and 100 square centimeters.

(d) Standard Transponder Data Message Format.

The standard portion of a transponder data message shall consist of a header and transaction record type code. The subsequent length, data content, and error detection scheme shall then be established by the definition for that transaction record type.

(e) Transponder Data Message Formats for AVI Toll Collection.

There may be numerous transponder–to–reader data message formats. The format is determined by the transaction record type code sent by the transponder. The following is the reader–to–transponder message format presently specified for AVI electronic toll collection applications:

(1) Transponder Transaction Type 1 (Data Message).

Transponder transaction type 1 (data message) allows for unencrypted transponder ID numbers to be transmitted. Type 1 (data messages) shall be structured using the following ordered data bit fields:

Field Definition	*No. Bits*	*Hexadecimal Value*
Header Code		
Selsyn	8	AA
Flag	4	C
Transaction Record Type Code	16	1
Transponder ID Number	32	
Error Detection Code	16	
	Total: 76	

(f) Transponder End–of–Message Frame

The End–of–Message signal for transponder data messages shall consist of a minimum of 10 microseconds of no modulation.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).
2. Amendment of subsections (d)–(e)(1) filed 5–1–98; operative 5–31–98 (Register 98, No. 18).

§ 1705.6. Transponder Response to Reader Acknowledge Message.

The transponder shall discontinue responding to identical reader polling requests for a period of 10 seconds once a valid reader acknowledgement message has been received. The transponder shall, however, re-

spond to polling messages that are not identical to the polling message that lead to the valid acknowledgement.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).
2. Amendment filed 5–1–98; operative 5–31–98 (Register 98, No. 18).

§ 1705.7. Multiple Transponder Responses to a Reader Polling Message.

Each transponder data message transmittal must be in response to a reader polling message.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).

§ 1705.8. Transponder Positioning.

Transponders shall be positioned at the front of the vehicle with a clear line of sight to the reader antenna without degrading the performance of the reader–transponder system below minimum specified standards. As a minimum, transponders shall operate up to a maximum of 76cm (30") offset from the longitudinal center line of the vehicle.

The front of the vehicle shall be defined as that portion of the vehicle from the driver's eyes forward.

NOTE: Authority cited: Section 27565, Streets and Highways Code. Reference: Sections 27564 and 27565, Streets and Highways Code.

HISTORY

1. New section filed 6–26–92; operative 7–27–92 (Register 92, No. 26).

Chapter 18. Junkyard Control

Article 1. General

§ 2000. Authority.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Sections 746(g), 746.3 and 759, Streets and Highways Code.

HISTORY

1. New Subchapter 18 (Articles 1–4, Sections 2000–2041, not consecutive) filed 3–11–80; effective thirtieth day thereafter (Register 80, No. 11).
2. Order of Repeal filed 8–26–82 by OAL pursuant to Government Code Section 11349.7(j) (Register 82, No. 35).

§ 2001. Application Zone.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Sections 746(f), (h), (i), and 747, Streets and Highways Code.

HISTORY

1. Repealer filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

Article 2. Definitions

§ 2010. Automobile Wrecker/Autowrecking Yard.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Sections 746(e), 746.3 and 759, Streets and Highways Code.

HISTORY

1. Repealer of article 2 (sections 2010–2016) and section filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

§ 2011. Highway.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Sections 746(f), (h), (i), Streets and Highways Code.

HISTORY

1. Repealer filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

§ 2012. Highway Beautification Easement.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Sections 751, 751.1 and 752, Streets and Highways Code.

HISTORY

1. Repealer filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

§ 2013. Owner.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Sections 745–759.3, Streets and Highways Code.

HISTORY

1. Repealer filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

§ 2014. Proprietor.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Sections 745–759.3, Streets and Highways Code.

HISTORY

1. Repealer filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

§ 2015. Screening.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Sections 747.1, 748, 749, 751 and 755, Streets and Highways Code.

HISTORY

1. Repealer filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

§ 2016. Visible.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Section 746.3, Streets and Highways Code.

HISTORY

1. Repealer filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

Article 3. Procedure

§ 2030. Industrial Zone Exception.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Sections 746.3 and 747, Streets and Highways Code.

HISTORY

1. Repealer of article 3 (sections 2030–2038) and section filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

§ 2031. Legal Yard.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Section 749, Streets and Highways Code.

HISTORY

1. Repealer filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

§ 2032. Industrial Zone.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Section 747, Streets and Highways Code.

HISTORY

1. Repealer filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

§ 2033. Illegal Yard.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Sections 746.3 and 747, Streets and Highways Code.

HISTORY

1. Repealer filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

§ 2034. Procedure.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Sections 754, 755, 756 and 757, Streets and Highways Code.

HISTORY

1. Repealer filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

§ 2035. Curing Illegality.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Sections 746.3 and 747, Streets and Highways Code.

HISTORY

1. Repealer filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

§ 2036. Nonconforming Yard.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Sections 748 and 749, Streets and Highways Code.

HISTORY

1. Repealer filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

§ 2037. Configuration.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Sections 746(a), 746.1, 746.2 and 748, Streets and Highways Code.

HISTORY

1. Repealer filed 9–16–96; operative 10–16–96 (Register 96, No. 38).

§ 2038. Cessation.

NOTE: Authority cited: Section 759, Streets and Highways Code. Reference: Section 746.2, Streets and Highways Code.

APPENDIX B

GENERAL CONDITIONS FOR BATA PURCHASE ORDERS

1. DEFINITIONS

a. BATA. The Bay Area Toll Authority.

b. MTC. Includes the Metropolitan Transportation Commission, the Metropolitan Transportation Commission Service Authority for Freeways and Expressways, or the Bay Area Transportation Authority.

c. Supplier. The individual, firm, partnership, corporation or combination thereof to whom a Purchase Order is mailed or otherwise furnished by BATA.

d. Contract. The legal agreement between BATA and the Supplier, which includes the terms of any written solicitation of Bids or Proposals and any deviation from the written specifications expressly accepted by BATA; the Supplier's bid, proposal, or offer; and all terms and conditions set forth in or attached to this Purchase Order. In the event of a conflict between one or more provisions of the Contract, the more specific or stringent provision with respect to Supplier's performance of the work shall apply.

2. ACCEPTANCE OF OFFER

This purchase order constitutes BATA's acceptance of Supplier's offer and becomes a binding contract, as defined above, when it is signed by BATA and mailed to Supplier. No revisions to or assignments of this order shall be valid unless in writing and signed by an authorized representative of BATA.

3. PERFORMANCE OF WORK

Supplier shall accomplish all the work and furnish all materials necessary for the completion of the work in a good, workmanlike and thorough manner and to the satisfaction of BATA, in accordance with the Contract.

4. CONTRACT PRICE

The firm fixed price(s) or other maximum payment set out in this purchase order, which includes full compensation to Supplier for performing all work required by the Contract, including all applicable federal, state and local taxes.

5. VARIATION IN QUANTITY, QUALITY OR PERFORMANCE

Any variation in the quantity, quality or performance of any item or service called for by this order shall be grounds for termination by default by BATA, as provided in 8a, unless approved by BATA in writing.

6. PACKAGING AND CRATING

All items shall be packed by Supplier in suitable containers for protection in shipment and storage. Prices set forth in this order include all charges for Supplier's packing, crating and marking for transportation to f.o.b. point.

7 INSPECTION AND ACCEPTANCE

Inspection and acceptance will be at destination, unless otherwise provided. Until delivery and acceptance, and after any rejections, risk of loss will be on the Supplier.

8. TERMINATION

a. If Supplier fails to comply with any of the provisions of the Contract, or in the event Supplier becomes the subject of a proceeding under state or federal law for relief of creditors, or if Supplier

makes an assignment for the benefit of creditors, BATA shall have the right to hold Supplier in default and cancel this order in whole or in part. In each event, BATA may obtain the items covered by the cancelled order from another Supplier and, if Supplier was selected as a result of a competitive procurement process, Supplier shall reimburse BATA for the excess cost to BATA, if any.

b. Without affecting its right to cancel this order under paragraph (a) above, BATA may terminate this order in whole or in part prior to shipment of goods or provision of services at no cost by providing written notice to the Supplier. In such event, BATA shall reimburse Supplier for non-recoverable costs incurred to date, not to exceed the Contract Price.

9. SCHEDULE
Unless otherwise agreed, material commitments and production arrangements should not be made by Supplier in excess of the amount or in advance of the time necessary to meet the specified delivery schedule. Time is of the essence in filling this order, and it is Supplier's responsibility to comply with BATA's delivery directions and/or schedule. Failure to deliver any item or provide any service called for by the contract within the time called for shall be grounds for termination for default as provided in 8.a.

10. INDEMNIFICATION
Supplier shall indemnify and hold harmless BATA, MTC, and their officers, agents and employees from and against all claims, demands, suits, loss damage, injury and liability, including any and all costs and expenses incurred in connection therewith, however caused, resulting from, arising out of or in any way connected with Supplier's performance of the Contract, including delivery of materials or equipment to BATA at the time and point of delivery indicated when delivery is an obligation of Supplier under the Contract.

11. INDEPENDENT CONTRACTOR
Supplier is an independent contractor and not an employee or agent of BATA.

12. PAYMENT
Supplier shall submit an invoice to BATA within thirty days after completion of work, unless otherwise specified in purchase order. BATA will pay invoices no later than thirty (30) days after their receipt conditioned upon approval of work done and amount billed. Invoices shall be made in writing and delivered or mailed to BATA as follows: Accounting Section, BATA, Joseph P. Bort MetroCenter, 101 Eighth Street, Oakland, CA 94607-4700.

13.OWNERSHIP OF SWITCHABLE TOLL TAGS
All prototype toll tags furnished to BATA by the Supplier shall be the property of BATA. Supplier hereby assigns to BATA ownership of all right, title and interest in and to such prototype toll tags.

14.GOVERNING LAW
All questions pertaining to the validity and interpretation of this Contract shall be determined in accordance with the laws of the State of California.